RECOMMENDED FISHERY BENEFICIAL USE DESIGNATION FOR COBB CREEK (FLORIDA CREEK) DEUEL COUNTY, SOUTH DAKOTA

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INTRODUCTION

Cobb Creek (also known as Florida Creek) is a small to medium sized perennial drainage of the Minnesota River Basin and is located in eastern Deuel County, South Dakota. The Cobb Creek catchment area is located on the Prairie Choteau, a glaciated region with an extensive network of prairie pothole wetlands. This portion of South Dakota has a semi-arid climate with fluctuating wet and dry cycles. Land-use within the catchment area is primarily agricultural with row crops and small grains on lower slopes and livestock grazing on steeper slopes. Two small towns (populations < 250) are located in relative close proximity of the stream; one near the headwaters (Toronto) and one near the middle (Brandt) of the profile. Lake Cochrane recreational area is located approximately 2.4 km north of the stream before it enters Minnesota.

LOCATION AND LEGAL DESCRIPTION

This document will address the beneficial uses assigned to the section of Cobb Creek listed in the Administrative Rules of South Dakota (ARSD) Chapter 74:51:03:04, Minnesota River's tributaries' uses include:

The segment of Cobb Creek from the South Dakota/Minnesota border to Section 19, Township 115 North, and Range 47 West and is designated the following beneficial uses:

(3) Coldwater marginal fish life propagation waters;
(8) Limited-contact recreation waters.

This segment will be referred to as the classified segment throughout the rest of the document. The change in beneficial uses discussed in this document only applies to this segment of Cobb Creek and not to the segment upstream of Section 19, Township 115 North, Range 47 west in Deuel County.

Specific water quality standard **criteria for coldwater marginal fish life propagation waters** (74:51:01:46) and **limited contact recreation waters** (74:51:01:51) designated to protect Cobb Creek are described in Chapter 74:51:01 of the South Dakota Surface Water Quality Standards (SDDENR, 1999).

STATEMENT OF NEED

Designated beneficial uses are not necessarily permanent and can be changed based on new knowledge about a waterbody. However, sufficient justification must be obtained before any beneficial uses can be assigned. The South Dakota Department of Environment and Natural Resources (SD DENR) has produced a guidance document for determining the fishery or recreational beneficial uses that should be assigned to any water body in South Dakota (SDDENR Surface Water Quality Program, 1999). The document is intended solely as a guidance tool for government agencies, local citizens

and other interested parties. The document provides a suite of recommended procedures needed for classification though additional customization is encouraged to address site-specific water bodies.

By definition a coldwater marginal fish life propagation water is "a beneficial use assigned to waters which support aquatic life and are suitable for stocked catchable-size coldwater fish during portions of the year, but due to critical natural conditions including low flows, siltation or warm temperatures, are not suitable for a permanent coldwater fish population. Warmwater fish may also be present."

The beneficial use of coldwater marginal fish life propagation was originally assigned to the designated segment of Cobb Creek due to historic stockings of Brown Trout (*Salmo trutta*) administered by South Dakota Game, Fish and Parks (SD GF&P). This coldwater species however, has not been stocked since the early and middle 1930's. It is highly unlikely that recruitment of *S. trutta* or any other Salmonid in the designated segment of Cobb Creek has occurred over the past 70 years. Due to this disparity it is also thought that the general public would not recognize Cobb Creek as a viable coldwater marginal fishery unless stocked on a yearly basis by GF&P.

This investigation follows the recommended procedures for reviewing beneficial use designations with a special emphasis on fisheries (SDDENR, 1999). Procedures were tailored to provide both narrative and numeric information necessary to provide an adequate evaluation of the appropriate beneficial use designation for the classified segment of Cobb Creek.

DATA COLLECTION AND METHODOLOGIES

Narrative information pertaining to the classified segment of Cobb Creek was acquired from state and local agencies. The Deuel County Conservation Officer was contacted to provide information about recreational fishing. An official of the Deuel County Conservation District (DCCD) was interviewed to provide information on the hydrologic status of the stream. An aquatic ecologist from GF&P provided fishery data and verbal information pertaining to future stocking intent.

A suite of chemical, physical and biological parameters were collected by environmental scientists from the SDDENR on July 12th 2005. Data collection was conducted at two downstream reaches of the classified segment of Cobb Creek (Appendix E). GF&P had recently sampled fish at two additional sites upstream and one site consistent with DENR. Figure 1 depicts the general location of the classified segment of Cobb Creek and sample sites for both DENR and GF&P sampling efforts. The classified segment is approximately 15.3 km of which the sampling sites represented 5.2 km of the downstream segment.

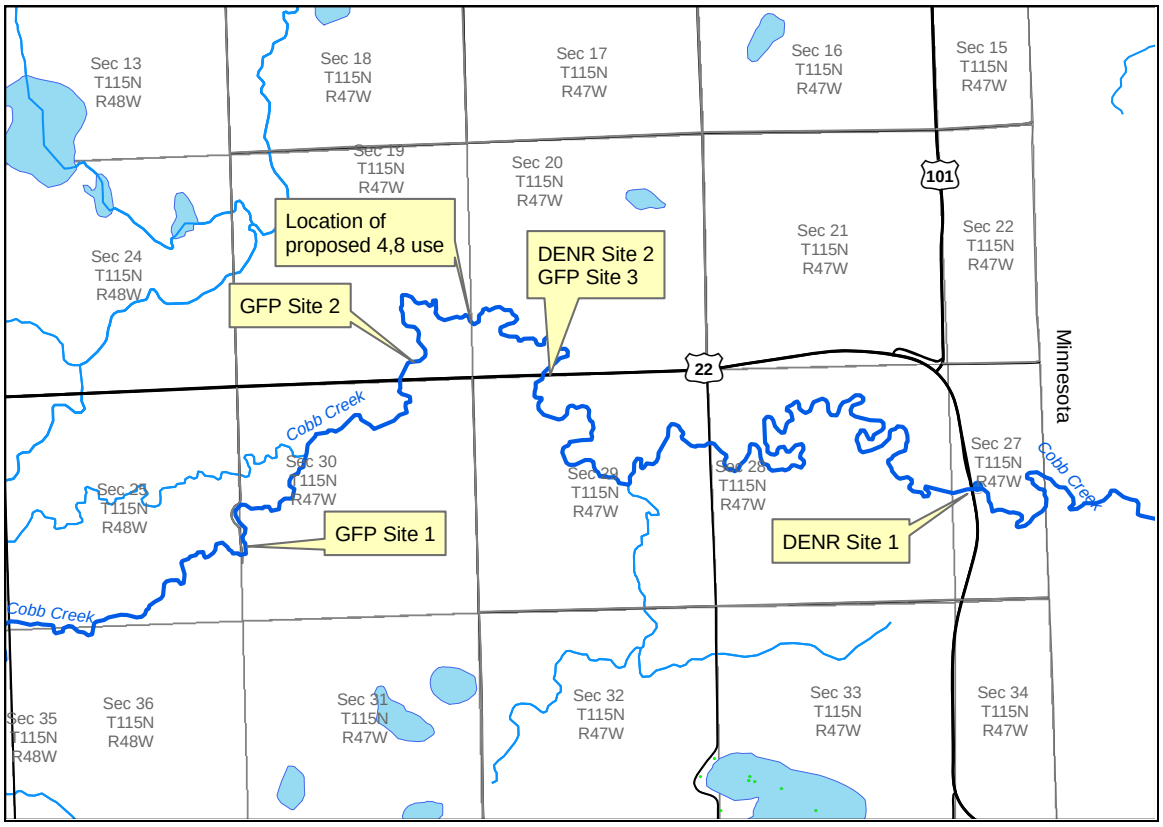

Figure 1. Classified segment of Cobb Creek Deuel County, SD including site locations for the fishery beneficial use designation investigation.

Instantaneous measurements of water temperature, pH, dissolved oxygen, specific conductance, and turbidity were collected with a YSI model 650 handheld display unit connected to a 6820 multi-probe sonde. This unit was calibrated in the field prior to conducting measurements (Appendix A). The pH probe was not functioning properly during the assessment. In addition, a HOBO © temperature probe was installed at site 1 to continuously monitor (every 15 minutes) water temperature from May 10th to August 15th 2005.

Nutrient and solids parameters were collected by grab sample using techniques explained in the EPA approved South Dakota Standard Operating Procedures for Field Samplers manual (SDDENR, 2005). The South Dakota Department of Health performed the analysis on all the above parameters in accordance with EPA and Standard Method protocols.

A visual habitat assessment was conducted at each site upstream (site 2) or downstream (site 1) of a bridge structure relative to the biological collection reach (Appendix E). Stream velocity was measured with a Marsh McBirney velocity meter at the upstream end of each assessment reach. Several environmental variables related to instream and riparian characteristics were quantitatively and qualitatively estimated and noted on a

physical measurement/observation data sheet (Appendix A and D). A Rapid Geomorphic Assessment (RGA) was used to quantify channel stability (Simon, 1989; Appendix A).

Fish collection was administered with a 9.1 meter bag seine (0.48 centimeter mesh) maneuvered downstream over a 30.5 meter reach at both sites respectively. A block net was established at the downstream end of both sites to maximize capture. Fish were identified, enumerated and lengths were recorded. Fish specimens were vouchered and preserved in 10% formalin. In addition, recent fish data was acquired from GF&P, which was collected with a backpack electro-fishing unit. Fish data from both efforts were used to review and evaluate fish related beneficial uses according to the beneficial use review document (SDDENR, 1999).

RESULTS AND DISCUSSION

Physiochemical Data

Continuous temperature data showed tremendous temporal variation across months (Appendix B). Individual temperature measurements ranged from 5.9^{o}C in May to 33.9^{o}C in July with a mean of 21.5^{o}C (median=22.6^{o}C) and a standard deviation around the mean of +/- 4.6^{o}C. This data indicates that summer water temperature often violates the current standard for a coldwater marginal fishery ($\leq$ 23.88^{o}C). These seasonal extremes in water temperature are common in prairie stream environments, in eastern South Dakota (Matthews 1988, Milewski 2001). Mean daily temperatures ranged from 7.1^{o}C (May) to 26.8^{o}C (July) suggesting that temperature exceedances are sustained during the summer months. Recent literature reviews suggest that Brown Trout (*Salmo trutta*) growth is stressed at 19.3^{o}C and an average temperature of 24.7 ^{o}C can cause an acute response (Dr. Scott Kenner, personal communication).

Water temperature data in Cobb Creek indicate that stress to coldwater fish species could occur as early as May and potential lethal conditions transpire as early as June. Cobb Creek is a relatively shallow wadeable stream likely providing homogenous temperatures void of significant thermal refuge. The effects of timely temperature stress on feeding habits of trout species during the growing season could limit angler success rates. Marginal trout establishment in Cobb Creek would likely be a costly venture with limited benefits to anglers.

Chemical data indicate moderate to minor changes from the upstream to the downstream reach (Table 1). Water color was indicated as a brown in the upper site and clear in the lower site. Turbidity and Total Suspended Solids (TSS) values were an order of magnitude higher in the upper site in comparison with lower site. Systemically livestock are prevalent in the upstream portion of the segment, while the downstream portion was observed to be void of livestock influences. Dissolved oxygen was adequate to support most aquatic life at both sites, respectively (Allan, 1995). Higher dissolved oxygen and

non-detectable biological oxygen demand values suggest that organic pollution is relatively minor within the segment.

pH was not collected during the assessment visit due to difficulties experienced with the probe. Despite the lack of pH data, it is not expected to be extreme in Cobb Creek as alkalinity is sufficient to buffer drastic fluctuations (Allan, 1995). Ammonia and nitrate concentrations were slightly higher at site 1 compared with site 2 while total kjeldahl nitrogen (organic) was comparable between sites. The higher concentrations at the downstream site are likely due to upstream influences however, local controls may be a factor. Both site 1 and 2 were nitrogen limited with ratios of 7.2 and 5.8 respectively (Allan, 1995). Total and dissolved phosphorus concentrations were similar between sites. The dissolved proportion of the total phosphorus accounted for approximately 70% at both sites respectively. Moderate fecal coliform bacteria at both sites suggest the presence of manure and may be associated with the elevated dissolved phosphorus concentrations.

Table 1. Physiochemical parameters by site collected at Cobb Creek during the investigation.

Parameter	Site 1	Site 2
Water color	clear	brown
Air Temperature ^{o}C	21.8	26.2
Water Temperature ^{o}C	22.6	25.02
Specific Conductance uS/cm	842	813
Dissolved Oxygen mg/L	8.86	7.82
Turbidity NTU	0.3	8.4
Alkalinity mg/L	284	295
Total Solids mg/L	628	616
Total Suspended Solids mg/L	13	29
Volatile Total Suspended Solids mg/L	5	7
Ammonia mg/L	0.07	<.02
Nitrate mg/L	0.3	0.1
Total Kjeldahl Nitrogen mg/L	0.87	0.89
Total Phosphorus mg/L	0.163	0.172
Total Dissolved Phosphorus mg/L	0.115	0.119
Biological Oxygen Demand mg/L	<2.0	<2.0
E.coli Bacteria Colonies/100ml	866	2420
Fecal Coliform Bacteria Colonies/100ml	1000	750

< signifies that the value is less than the health lab detection limit

Habitat Characteristics

Significant differences in stream habitat were observed between the upper and lower sites (Appendix A). An official from the DCCD indicated that Cobb Creek experienced bankfull discharge due to a large storm-event that moved through the watershed one week prior to the investigation. During the investigation the DCCD official indicated that the stream had returned to a base-flow condition, commonly observed during ice-free periods. Based on this information Cobb Creek is assumed a perennial stream in the absence of a dry cycle or drought.

Positive stream velocity averaged 0.2 feet per second (ft/sec) at site 1 and 1.02 ft/sec at site 2. Higher velocity at site 2 was attributed to moderate channel incision which acts to constrict flow. Average depth of riffles was estimated at 0.3 meters and pools 0.6 meters with a maximum depth of 1 meter. The downstream site is contained within a steep valley however; the channel is wider and less incised providing reduced flow constriction and easy floodplain access. Average depth of riffles was 0.1 meters and pools 0.6 meters with a maximum depth of 1 meter. Discharge was 5.2 cubic feet second (cfs) at site 1 and 4.7cfs at site 2 suggesting a 0.5 cfs difference between sites (Appendix A). Higher discharge at site 1 is attributed to ground water springs within the steep valley containment. Based on the conversation with the DCCD official this is likely the typical base flow condition for Cobb Creek during ice-free periods.

Both sites contained pool-riffle sequences though riffles at site 1 were clearly defined with large gravel and cobble/boulder substrates. Riffles at site 2 were less defined and were composed primarily of silt-sand and small gravel. However, a small cobble riffle was observed several meters upstream from the assessment reach. Site 1 contained a medley of substrate types including boulder, cobble, gravel (many sizes), silt/sand, detritus, aquatic macrophytes and woody debris. Boulder and cobble were the primary substrates found at site 1. Substrate composition at site 2 was less diverse and dominated primarily by silt and sand.

Bank slumpage and accretion was evident at site 2, however channel deposition was minimal with some siltation in pools. Site 1 had one small bank related depositional feature though most banks were undercut with overhanging vegetation. Minimal silt and sand was also evident in pools. Channel stability scores (RGA's) revealed site 1 as the most stable channel scoring a 7.0, while site 2 scored an 18. The higher the score the more unstable the channel is in respect to stage of channel evolution. Site 1 was classified as a stage I stream signifying maximum stability. Site 2 was classified as a Stage V signifying that the channel has down-cut and is in the process of aggrading (Simon 1989).

Channel debris was evident at site 2 in the form of small sticks and other organic materials, while site 1 contained many variable sized log jams and larger pieces of woody debris. No major hydrologic alterations such as, channelization or ditching was apparent at either site. In addition, no sludge type materials were present in the substrate profile.

No apparent landuse was observed in the riparian zone immediately up or downstream of site 1. The riparian and floodplain (relatively narrow) was dominated by mature trees; primarily old succession Oaks which provided exceptional shade to the stream. The immediate banks were covered was grass-forbes and shrubs with few saplings. The banks were well protected with root structure of all cover types.

Landuse within the riparian zone at site 2 was primarily low-use pasture. The riparian and floodplain was dominated by grass-forbes. Some overhanging vegetation provided shading however, tree cover was absent.

The instream habitat and riparian characteristics including channel stability and stage of channel evolution present at site 2 was observed to be the most representative condition within the classified segment of Cobb Creek. The exceptional instream and riparian characteristics of site 1 was only present in approximately 1.0 km of the furthest downstream end of the segment. GF&P indicated that the extreme upper portion of the classified segment is low gradient and dominated by wetland marshes.

Fish Community Characteristics

The representative fish community within the classified segment of Cobb Creek was dominated exclusively by warm-water fish species (Table 2). DENR net data captured 11 species of fish and GF&P collected 4 additional species using electro-fishing. Overall, 15 species of fish were collected from both DENR and GF&P efforts. As expected, neither GF&P nor DENR capture efforts revealed any coldwater species in particular *Salmo trutta*. The local conservation officer indicated that Cobb Creek is not a popular angling destination and that he had never witnessed anyone fishing the stream.

Relative total abundance ranged from 169 individuals at DENR site 1 to 1,785 individuals at GF&P site 1. Overall electro-fishing conducted by GF&P produced higher relative total abundances compared to DENR net data. However, results are not based on Catch per Unit Effort (CPUE). Common Shiner, Central Stoneroller, and Creek Chubs were the most abundant species from all sites and methods respectively (Table 2).

Table 2. Relative abundance by fish species from DENR and GF&P collection efforts.

Relative Abundance						
Common Name	Scientific Name	DENR Site 1	DENR Site 2	GF&P site 1	GF&P site 2	GF&P site 3
Bigmouth shiner	*Notropis dorsalis*			118	24	8
Black Bullhead	*Ictalurus melas*	1	12			1
Blacknose Dace	*Rhinichthys atratulus*		3	342	9	30
Blackside darter	*Percina maculata*					1
Bluntnose Minnow	*Pimephales notatus*	21	20	29	15	25
Brassy Minnow	*Hybognathus hankinsoni*	1		194	12	8
Brook StickleBack	*Culaea inconstans*	1	1	14	2	4
Central Stoneroller	*Campostoma anomalum*	53	53	454	114	170
Common carp	*Cyprinus carpio*					1
Common Shiner	*Notropis cornutus*	50	68	369	197	164
Creek Chub	*Semotilus atromaculatus*	31	50	205	76	60
Fathead Minnow	*Pimephales promelas*	3	1	27	5	15
Hornyhead chub	*Nocomis biguttatus*			12	42	30
Johnny Darter	*Etheostoma nigrum*	4	10	13	26	13
White Sucker	*Catostomus commersoni*	4	5	8	4	11
Total		**169**	**223**	**1785**	**526**	**541**

Several different age classes of fish were observed within both DENR sites respectively (Figures 2 and 3). Several small Young of the Year (YOY) fish were also observed in both sites however they were not effectively captured due to mesh size of the seine. Length data was not available from GF&P capture efforts.

Fish lengths ranged from 20 to 200mm at site 1 and 20 to 220mm at site 2. Cumulative fish length was relatively normally distributed for both sites with most fish ranging in length from 40 to 100mm respectively. The top four species by abundance for both DENR sites (Common Shiner, Central Stoneroller, Creek Chub and Bluntnose Minnow) showed excellent length distribution (Appendix C). Based on length frequency of these abundant fish species it is assumed that multiple year classes are present. In addition, variable length distribution was evident in the White Sucker, which ranged in length from 30 to 215mm between sites (Appendix A). The remaining species were collected in low abundance and were assumed to be of mature age. In addition, several size classes of crayfish were also collected however, the majority occurred from site 1.

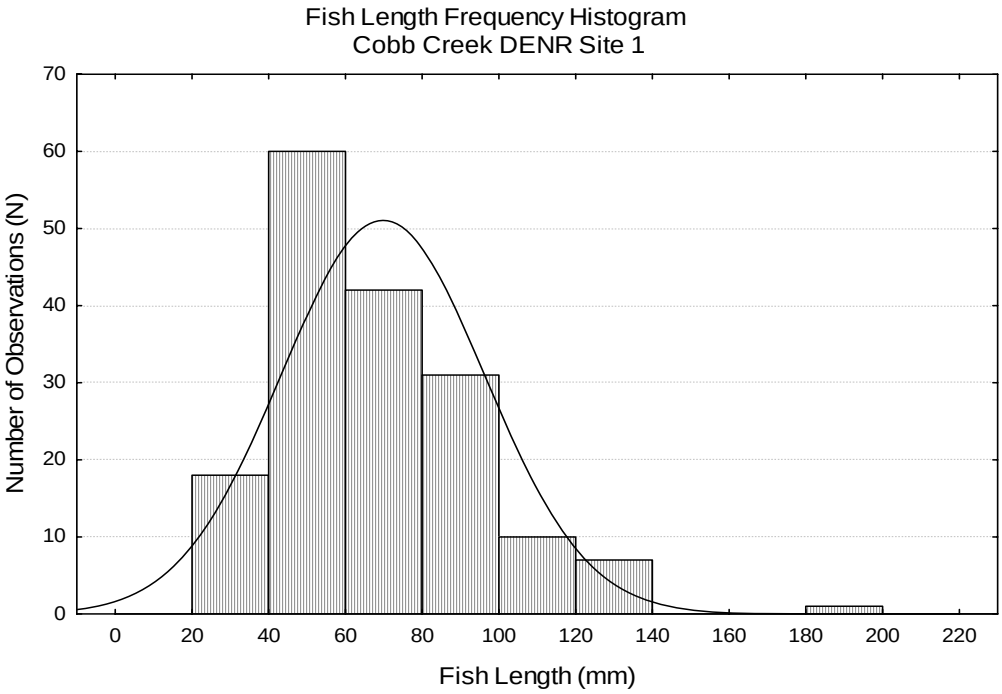

Figure 2. Length frequency histogram depicting cumulative fish lengths for all species collected at DENR site 1.

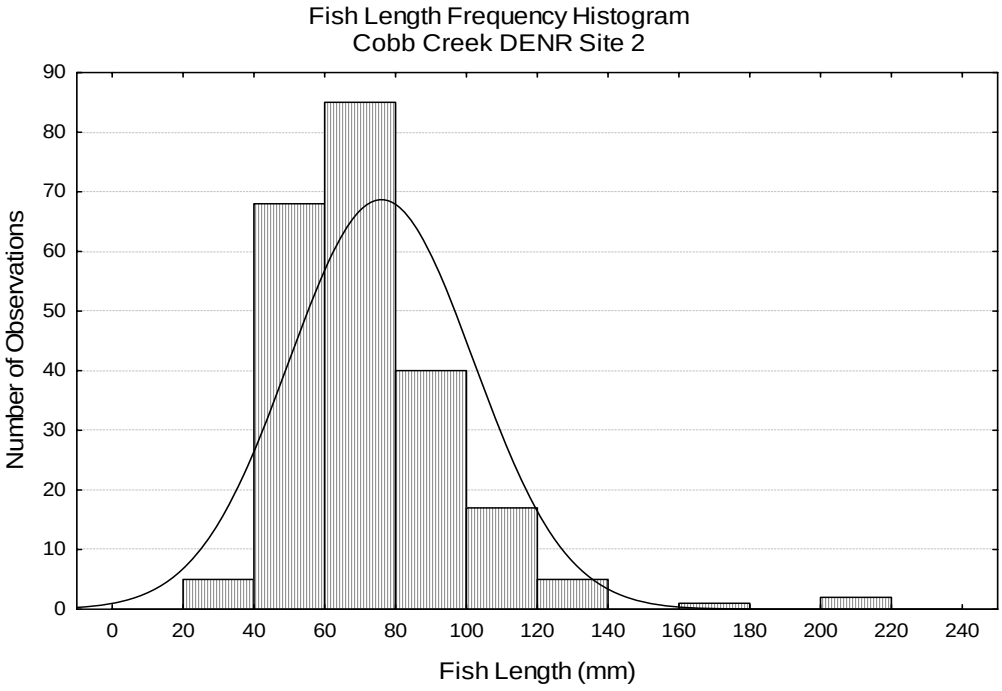

Figure 3. Length frequency histogram depicting cumulative fish lengths for all species collected at DENR site 2.

The representative fish community of Cobb Creek was dominated by generalist species with a range of tolerance and feeding guild associations (Scott and Grossman 1973, Allan 1995, Barbour et al. 1999, Table 3). The feeding habits of most fish species suggest a community dominated by insectivores and omnivores. Insectivores primarily feed on terrestrial and aquatic invertebrates with most emphasis on the latter. Though macroinvertebrates were not colleted during this investigation countless species were observed in debris that collected in the seine.

Omnivores are less selective than insectivores and will consume both plant and animal material. Most omnivore species collected during this effort will consume items such as detritus, algae, diatoms, and small invertebrate larvae (Scott and Crossman 1973). The Central Stoneroller is the only herbivore collected during the investigation. This species has specialized mouthparts for scraping algae from the surfaces of rocks, wood and other surfaces. No predatory species were collected during the assessment however, adult Black Bullhead and Creek Chubs will occasionally prey on small fishes.

Eight fish species were categorized as intermediate tolerance to varying water quality conditions. Intermediate species require certain water quality conditions that support both habitat and feeding requirements. The remaining 7 species are tolerant to a wide range of perturbation and would likely be the last species to vacate a disturbed stream environment. The high occurrence of intermediate species suggests that Cobb Creek provides a relatively stable environment.

Most species encountered during this investigation (exception Common Carp, Black Bullhead, Fathead Minnow and White Sucker) prefer small to medium streams with sand, silt and gravel substrates. In general, gravel substrate associated with riffle and pool habitat is important spawning substrate for most species.

Table 3. Trophic structure of fish species collected from DENR and GF&P efforts.

		Trophic Structure		
Common Name	Scientific Name	Feeding	Tolerance	Trophic
Bigmouth shiner	*Notropis dorsalis*	insectivore	intermediate	generalist
Black Bullhead	*Ictalurus melas*	insectivore	tolerant	generalist
Blacknose Dace	*Rhinichthys atratulus*	insectivore	tolerant	generalist
Blackside darter	*Percina maculata*	insectivore	intermediate	generalist
Bluntnose Minnow	*Pimephales notatus*	omnivore	tolerant	generalist
Brassy Minnow	*Hybognathus hankinsoni*	omnivore	intermediate	generalist
Brook StickleBack	*Culaea inconstans*	insectivore	intermediate	generalist
Central Stoneroller	*Campostoma anomalum*	herbivore	intermediate	generalist
Common carp	*Cyprinus carpio*	omnivore	tolerant	generalist
Common Shiner	*Notropis cornutus*	insectivore	intermediate	generalist
Creek Chub	*Semotilus atromaculatus*	insectivore	tolerant	generalist
Fathead Minnow	*Pimephales promelas*	omnivore	tolerant	generalist
Hornyhead chub	*Nocomis biguttatus*	insectivore	intermediate	generalist
Johnny Darter	*Etheostoma nigrum*	insectivore	intermediate	generalist
White Sucker	*Catostomus commersoni*	omnivore	tolerant	generalist

CONCLUSIONS

This investigation provides the narrative and numeric chemical, physical and biological information necessary to classify the fishery beneficial use designation for the classified segment of Cobb Creek, Deuel County, South Dakota. Continuous water temperature monitoring data suggests that the current standard (22.8^{o}C) is violated on a regular basis during June, July and August. This is considered a natural occurrence for small to moderate prairie streams in eastern South Dakota. Solids and nutrient samples showed minimal differences between upstream and downstream sites. The upper site had higher measures of TSS and turbidity, while the downstream site had slightly higher ammonia and nitrate values. Both conditions were attributed to upstream influence and potential local controls. Phosphorus concentrations at both sites were moderate making the stream nitrogen limited. The dissolved portion of phosphorus was relatively high (70%) for both sites respectively. Moderate fecal coliform counts indicated the presence of animal waste which was attributed to the elevated dissolved phosphorus concentrations. In general, organic loading is thought to be relatively minor in Cobb Creek.

Instream and riparian habitat characteristics significantly differed between the upper and lower sites. The local conservationist indicated that Cobb Creek endures perennial flow during ice-free periods. Flow measurements conducted during base flow conditions indicated a 0.5 cfs surplus from the upper to lower site. Groundwater influences within the steep valley containment at the lower site likely attributed to this variation. The lower site had high substrate diversity, undercut banks and associated overhanging vegetation, excellent channel stability, well defined cobble-boulder riffles and forested riparian and floodplain vegetation with no apparent land- use alteration. The upper site was dominated by silt-sand substrate with a moderate density of small gravel. The channel was moderately incised and deposition due to bank slumpage was evident throughout the reach. The channel was relatively unstable and in the evolutionary process of aggrading. The riparian zone and floodplain was low-use pasture with a relatively high density of grasses and forbes. The upstream site (site 2) was identified as the most characteristic of the classified segment of Cobb Creek as variation observed at the lower site was only present over a short distance.

The local conservation officer indicated that Cobb Creek is not a popular angling destination and that he had never witnessed anyone fishing the stream. Overall, 15 species of warmwater fish were identified in the assessed reaches of the stream. Cumulative fish lengths ranged considerably though most fish were in the 40-100mm size class. The most abundant (DENR net data) fishes were Common Shiner, Central Stoneroller, Creek Chub, and Bluntnose Minnow. These species also displayed variable length distribution suggesting multiple age classes. Small YOY fishes were observed however, seine mesh size was too large for effective capture. All species were considered generalists with the majority being omnivores and insectivores. Several species had intermediate tolerances suggesting Cobb Creek is a relatively stable system. Most species prefer small to moderate streams with riffle habitat and silt-sand and gravel substrate. A majority of the fish species were consistently collected over 1/3 of the classified segment and likely represent the resident community of Cobb Creek.

RECOMMENDATIONS

During this investigation a local conservation official from the DCCD confirmed that the classified segment of Cobb Creek characteristically maintains perennial flows during ice-free periods of normal precipitation. In addition, an aquatic ecologist from GF&P suggested that base flow increases from the headwaters of the classified segment to the downstream border attributing the change to increasing groundwater influences along the longitudinal profile. This was evident from stream flow measurements conducted during this investigation.

Temporal variation with an emphasis on summer extremes is a natural occurrence in prairie stream environments (Matthews 1988, Milewski 2001). Continuous temperature data manifests Cobb Creek as a typical prairie stream commonly enduring temporal fluctuations during ice-free conditions. The ensuing fish communities of prairie streams are well-adapted to such extremes. The fish community encountered during this assessment was exclusively comprised of warmwater species.

Based on the acquired knowledge of the classified segment of Cobb Creek an evaluation of the fish related beneficial uses was conducted (Section E., SDDENR, 1999). Following the stepwise process the classified segment of Cobb Creek should be classified as a "**warmwater permanent fish life propagation waters**."

The beneficial use determination was reached by the following justifications. First, no coldwater species were collected or have been stocked since the 1930's. Second, warmwater species were exclusively present. Third, length frequency data along with YOY observations suggest multiple year classes supporting the occurrence of natural reproduction. Fourth, fish kills occur on a rare basis, with the last reported in 1996.

It is highly unlikely that GF&P would ever re-stock a Salmonid species in Cobb Creek. The reason given is that public access is lacking and few if any interest has been expressed by local residents. Based on data collected during this investigation stocking catchable sized trout would likely be a costly venture with limited benefits to anglers.

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